

Year 2005

VCE

Further Mathematics

Trial Examination 1

Suggested Solutions

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Question 1 C $38.4 - 34.6 = 3.8$	Question 2 D Overall, males earn more than females. Range for males = $43.2 - 34.2 = 9$ Range for females = $40.0 - 28.8 = 11.2$ $\therefore$ females have larger range than males 25% of males have a salary less than \$34,600 25% of females have a salary less than \$34,000 and 25% of females have a salary greater than \$37,200, which makes D correct. 50% of males have a salary between \$34,000 and \$38,400
Question 3 E 2.5% are greater than the mean plus 2 times the standard deviation. $77 - 55 = 22$ 2 times the standard deviation = 22 standard deviation = 11	Question 4 D Total number of Liberal voters = $16 + 83 = 99$ Total number of Labour voters = 127 Total number of voters = $127 + 99 = 226$
Question 5 B Number of people who did not want a republic and voted labour = $127 - 55 = 72$ Number of people who did not want a republic = $72 + 83 = 155$ % of people who did not want a republic and voted labour = $\frac{72}{155} \times 100 = 46\%$	Question 6 C $r^2 = 0.0676$ $r = -0.26$ because x increases as y decreases Hence correlation is weak, negative.
Question 7 B Median of lower 3 points is (65,10) Median of upper 3 points is (85,16) $m = \frac{16 - 10}{85 - 65} = \frac{6}{20} = 0.3$	Question 8 A $b = \frac{1}{3}[(y_l + y_m + y_u) - m(x_l + x_m + x_u)]$ $= \frac{1}{3}[(10 + 10 + 16) - 0.3(65 + 75 + 85)]$ $= \frac{1}{3}[36 - 67.5]$ $= -10.5$

Question 9 C There is an up and down pattern, and the pattern does not repeat itself within a year but over 4 to 5 years. $\therefore$ Cyclic trend	Question 10 A From the graph it can be seen that there is a negative residual then 2 positive residuals then 2 negative residuals and then a positive residual. Graph B starts with zero residual so not B Graph starts with a positive residual so not C Graph D has negative residual then positive then negative so not D Graph E starts with 2 negative residuals so not E
Question 11 D $1.02 + 0.82 = 1.84$ Summer index + Autumn index $= 4 - 1.84 = 2.16$ Summer index is double Autumn index $\therefore$ 3 times Autumn index = 2.16 Autumn index = 0.72 Summer index = $2 \times 0.72 = 1.44$	Question 12 A $\frac{3.2 + 2.8 + 4.9}{3} = 3.6$ Question 13 B Yearly average for 2005 = $\frac{7.7 + 5.9 + 7.5 + 9.3}{4} = 7.6$ Yearly average for 2003 = 7.65 Yearly average for 2004 = 7.675 Summer 2003 $5.8 \div 7.65 = 0.7582$ Summer 2004 $5.6 \div 7.675 = 0.7296$ Summer 2005 $5.9 \div 7.6 = 0.7763$ Seasonal index for summer = $\frac{0.7582 + 0.7296 + 0.7763}{3} = 0.7547$ Deseasonalised value = $\frac{5.9}{0.7547} = 7.8$

Question 1 D Arithmetic sequence $t_1 = 5$ $t_2 = 8$ $t_3 = 11$ $d = 8 - 5 = 3$	Question 2 B $S_n = \frac{n}{2}(a + l)$ $S_n = \frac{10}{2}(7 + 37)$ $S_n = 5 \times 44 = 220$
Question 3 D $S_\infty = \frac{a}{1-r} = \frac{3}{1-\frac{1}{2}} = 6$	Question 4 A Total of 8 shares. Sam's share = $\frac{1}{8} \times 120,000 = \\$15,000$
Question 5 B $8 + 13 + 18 + 23 = 62$ (four terms) $62 + 28 = 90$ (five terms) $90 + 33 > 100$ $\therefore$ six terms	Question 6 C $t_n = ar^{n-1}$ $t_5 = 3000 \times 0.94^4 = 2,342$

Question 7 E

Each term is 0.94 times the term that went before.

$$t_{n+1} = 0.94t_n$$

$$t_1 = 3000$$

Question 8 B

$$S_4 = \frac{4}{2}[2a + 3d] = 54$$

$$S_8 = \frac{8}{2}[2a + 7d] = 156$$

$$4a + 6d = 54$$

$$8a + 12d = 108$$

$$8a + 28d = 156$$

$$16d = 48$$

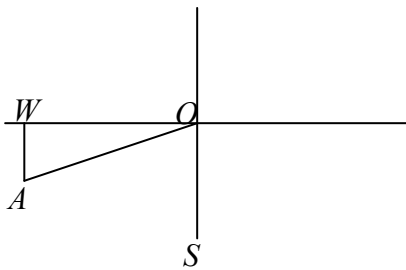
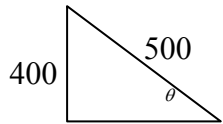
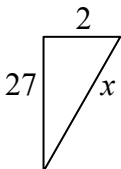
$$d = 3$$

Question 9 E

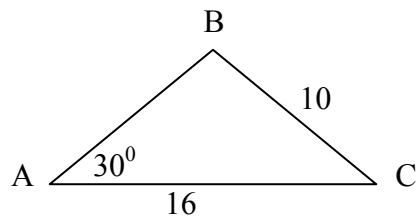
$$s_1v_1 = s_2v_2$$

$$20 \times v_1 = 15 \times 1$$

$$v_1 = \frac{15}{20} = \frac{3}{4} = 0.75$$

Question 1 C $\cos \theta = \frac{8}{14}$ $\theta = \cos^{-1}\left(\frac{8}{14}\right) = 55^{\circ}$	Question 2 C  Angle WAO and angle SOA are equal (alternate angles) $\therefore$ bearing is $180 + 55 = 235^{\circ}\text{T}$
Question 3 D  $\sin \theta = \frac{400}{500}$ $\theta = \sin^{-1}\left(\frac{400}{500}\right) = 53^{\circ}$	Question 4 D 1 : 64 1000 : 64000 Ratio of sides = ratio of cube root of volumes Ratio of sides = 10 : 40 Ratio of area of face = square of sides Ratio of area of face = 100 : 1600 Area of face of cube B = 1600
Question 5 E Triangles AOB and DOC are similar (AAA) $\therefore$ corresponding sides are in the same ratio $\frac{2.5}{1} = \frac{OC}{4}$ $OC = 10$	Question 6 C  $x^2 = 2^2 + 27^2$ $x = \sqrt{2^2 + 27^2}$ $x = 27.1$

Question 7 D



$$\frac{10}{\sin 30} = \frac{16}{\sin B}$$

$$\sin B = \frac{16 \sin 30}{10}$$

$$B = \sin^{-1}\left(\frac{16 \sin 30}{10}\right)$$

$$B = 53^\circ \text{ or } 180 - 53 = 127^\circ$$

Question 8 D

By Pythagoras, $AC = 13$

Using the cosine rule on triangle ACD

$$13^2 = 8^2 + 6^2 - 2 \times 8 \times 6 \cos \theta$$

$$69 = -96 \cos \theta$$

$$\cos \theta = -0.71875$$

$$\theta = 180 - 44 = 136^\circ$$

Question 9 D

Area of 2 triangles + area of two slanting rectangles + area of base rectangle

Slant side of triangle = 5 (Pythag)

$$A = 2 \times \frac{1}{2} \times 6 \times 4 + 2 \times 12 \times 5 + 6 \times 12$$

$$A = 24 + 120 + 72$$

$$A = 216$$

Question 1 A x intercept occurs when $y = 0$ $3x - 6 = 0$ $x = 2$	Question 2 D $2x - 3y = -7$ (1) $3x + 8y = 2$ (2) $(1) \times 3 \rightarrow 6x - 9y = -21$ (1a) $(2) \times 2 \rightarrow 6x + 16y = 4$ (2a) $(2a) - (1a) \rightarrow -25y = -25$ $y = 1$ When $y = 1$, $3x = 2 - 8 = -6$ $x = -2$
Question 3 B 30 cents = \$0.3 for one minute of calls $= 0.3n$ for n minutes of calls, plus the \$35 basic charge. $C = 0.3n + 35$	Question 4 E Gradient = 2 since parallel to line with gradient of 2 $y = 2x + c$ When $x = -1, y = -4$ $-4 = -2 + c$ $c = -2$ $y = 2x - 2$ $\therefore y - 2x + 2 = 0$
Question 5 A The line $x + y = 3$ cuts the axes at (3,0) and (0,3) $\therefore$ not E The line $2y - 3x + 4 = 0$ cuts the y axis when $x = 0$ $2y + 4 = 0$ $y = -2$ The line $2y - 3x + 4 = 0$ cuts the x axis when $y = 0$ $-3x + 4 = 0$ $x = \frac{4}{3} = 1\frac{1}{3}$ $\therefore$ not C or D We want the area under the line $x + y = 3$ and over the line $2y - 3x + 4 = 0 \therefore$ A	Question 6 C Profit / book = Revenue / book - Cost / book $P = \frac{25x}{x} - \frac{18x - 1200}{x}$ $P = \frac{25x - 18x + 1200}{x}$ $P = \frac{7x + 1200}{x}$

Question 7 A The equation of the line joining the points (3,7) and (5,11) is of the form $y = mx + c$ $m = \frac{11 - 7}{5 - 3} = \frac{4}{2} = 2$ $y = 2x + c$ When $x = 3, y = 7$ $7 = 6 + c$ $c = 1$ Equation of this line is $y = 2x + 1$ $\therefore$ not C, D, E The open circles are not included. The closed circles are included. $\therefore$ A	Question 8 C The height of the water increases rapidly at first, and then less rapidly, showing that the vase is narrow at the bottom but getting wider nearer the top.
Question 9 E From the labels on the axes, it can be seen that $y = kx^2$ When $x^2 = 16, y = 80$ $80 = k \times 16$ $k = 5$ $\therefore y = 5x^2$	

Question 1 B Amt. Repaid = $530 \times 4 = 2120$ Interest = $2120 - 2000 = \\$120$	Question 2 E On Jan.1st Luke has a balance of \$4,400 On Jan.12th Luke has a balance of \$5,000 On Jan.17th Luke has a balance of \$4,700 On Jan.28th Luke deposited \$200 Total deposits for Jan.=$200 + 400 + 200 = \\$800$
Question 3 D On Jan.1st Luke has a balance of \$4,400 On Jan.12th Luke has a balance of \$5,000 On Jan.17th Luke has a balance of \$4,700 On Jan.28th Luke has a balance of \$4,900 Minimum balance for the month = \$4,400	Question 4 D 10% of 1,800 = 180 180 + 1,800 = \$1,980
Question 5 C Change in population from 2000 to 2005 = $720 - 480 = 240$ Decrease in 5 years = 240 Decrease /year = $240 \div 5 = 48$ Decrease in 8 years = $48 \times 8 = 384$ Number rabbits after 8 years = $720 - 384 = 336$	Question 6 C $A = PR^n = \frac{Q(R^n - 1)}{R - 1}$ $P = 10,000$ $R = 1 + \frac{8}{12 \times 100} = 1.0067$ $n = 9$ $A = 10,000(1.0067)^9 - \frac{600(1.0067^9 - 1)}{0.0067}$ $A = \\$5072.4$

Module 4 Business-related mathematics. Suggested solutions.

Question 7 D

$$A = PR^n$$

$$P = 30,000$$

$$R = 1 + \frac{5.5}{2 \times 100} = 1.0275$$

$$n = 10$$

$$A = 30,000 \times (1.0275)^{10} = \$39,349.5$$

Question 8 D

$$\text{When } t = 0, N = 1500$$

$$\text{Double } N = 3000$$

$$3000 = 1500(1.08)^t$$

$$2 = 1.08^t$$

$$\log_{10}(2) = t \log_{10}(1.08)$$

$$t = \frac{\log_{10}(2)}{\log_{10}(1.08)}$$

$$t = 9.006$$

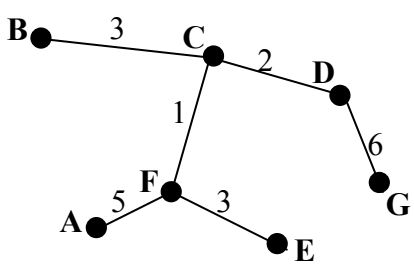
Question 9 E

$$A = PR^n - \frac{Q(R^n - 1)}{R - 1}$$

$$0 = 200,000(1.015)^{100} - \frac{Q(1.015^{100} - 1)}{0.015}$$

$$Q(1.015^{100} - 1) = 13296.13695$$

$$Q = \$3874.11$$

Question 1 C $V + F - E = 2$ $V = 10$ $F - E = -8$ $E - F = 8$ $E = F + 8$ Minimum value for $F = 1$ $\therefore$ Minimum value for $E = 1 + 8 = 9$	Question 2 D $A = 2$ $E = 2$ $B = 6$ $F = 1$ $C = 2$ $G = 3$ $D = 2$ Sum = $2 + 6 + 2 + 2 + 2 + 1 + 3 = 18$
Question 3 C A Hamiltonian circuit passes through each vertex once, beginning and ending at the same vertex.	Question 4 C A simple graph has no loops and no multiple edges between two vertices.
Question 5 D A to A is 0 (top left hand corner) $\therefore$ must be D	Question 6 E  Minimum spanning tree $= 3 + 1 + 5 + 3 + 2 + 6 = 20$

Question 7 B A critical path is one where any delay on this path will cause a delay in completing the project.	Question 8 E Andrew plays 2 sports and Ben plays 3 sports. $\therefore$ not A One person plays tennis and one person plays squash. $\therefore$ not B Dave and Carla both participate in one sport each. $\therefore$ not C Number of people playing both cricket and tennis = 1 Number of people skiing = 3 $\therefore$ not D Number of people playing squash, netball or tennis = 3 $\therefore$ E
Question 9 A Start with A $ABD = 14, AD = 5, ACD = 11 \therefore ABD$ $ABDE = 21, ABE = 20 \therefore ABDE$ $ABDEG = 29, ABDG = 22, ABDFG = 24$ $\therefore ABDEG$ is the critical path.	

End of suggested solutions
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